

CLAIMS

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Cont 1. A three-dimensional image capturing device, comprising:
a light source that radiates a distance measuring light
beam irradiating a measurement subject, said measurement subject
5 reflecting said distance measuring light beam to generate a
reflected light beam;

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a plurality of first photoelectric conversion elements
and second photoelectric conversion elements, arranged in a
predetermined direction, that receive said reflected light beam,
10 so that electric charge corresponding to an amount of said received
reflected light beam is accumulated in each of said first and
second photoelectric conversion elements;

a first electric charge holding unit disposed adjacent
to each of said first photoelectric conversion elements;

15 a second electric charge holding unit disposed adjacent
to each of said second photoelectric conversion elements;

a first electric charge transfer processor that transfers
first electric charge accumulated in said first photoelectric
conversion elements to said first electric charge holding unit
20 with first electrodes connected only to said first electric
charge holding unit;

a second electric charge transfer processor that
transfers second electric charge accumulated in said second
photoelectric conversion elements to said second electric charge
25 holding unit with second electrodes connected only to said

charge to said substrate.

4. A device according to claim 1, wherein said first and second electric charge holding units are provided in a vertical transfer unit that outputs said electric charge from said three-dimensional image capturing device.

5. A device according to claim 1, wherein said first photoelectric conversion elements are arranged in a predetermined direction with a predetermined number of said second photoelectric conversion elements in between.

6. A device according to claim 2, wherein said first electric charge discharging processor outputs an electric charge discharging signal to discharge said unwanted charge, and said first electric charge holding processor outputs a first electric charge transfer signal to transfer said first electric charge to said first electric charge holding unit, and said second electric charge holding processor outputs a second electric charge transfer signal to transfer said second electric charge to said second electric charge holding unit, said electric charge discharging signal and said first and second electric charge transfer signals being pulse signals.

7. A device according to claim 6, wherein said first electric charge, corresponding to at least distance information of said measurement subject, accumulates in said first photoelectric conversion elements until a receiving of said reflected light beam by said first photoelectric conversion elements ends.

8. A device according to claim 7, wherein said first electric charge, corresponding to at least distance information of said measurement subject, starts to accumulate in said first photoelectric conversion elements when an output of said electric charge discharging signal ends.

9. A device according to claim 6, wherein said light source radiates a pulsed beam of said distance measuring light beam during a first accumulating period, which is from an output of said electric charge discharging signal to an output of said first electric charge transfer signal, and said first electric charge corresponding to distance information regarding said measurement subject is integrated in said first electric charge holding unit.

10. A device according to claim ² 1, comprising:

a radiating operation control processor that prohibits a radiation of said distance measuring light beam from being radiated from said light source; and

an image information sensing processor that drives said first and second electric charge discharging processors and said first and second electric charge transfer processors, on condition that said radiation of said distance measuring light beam prohibited by said radiating operation control processor, so that said first and second electric charge corresponding to an image information of said measurement subject is transferred to said first and second electric charge holding units

respectively.

11. A three-dimensional image capturing device, comprising:
a light source that radiates light irradiating a
measurement subject;

5 a plurality of optical sensors that generate electric
charge corresponding to an amount of light received by said optical
sensors and is separated into predetermined groups;

electric charge transfer electrodes that are applied to
each of said optical sensors in order to transport said electric
10 charge generated in said optical sensors to the outside of said
optical sensors;

an electric charge transfer unit that holds said electric
charge transferred from said optical sensors by said electric
charge transfer electrodes and transports said electric charge
15 held in said electric charge transfer unit;

an electric charge transfer electrode control processor
that can control each said group of said electric charge transfer
electrodes independently; and

an electric charge accumulating processor that
20 repeatedly drives said electric charge transfer electrode
control processor and repeatedly transfers electric charge
generated in certain said groups of said optical sensors, so
that transferred electric charge accumulates in said electric
charge transfer unit.

25 12. A three-dimensional image capturing device, comprising:

a light source that radiates a distance measuring light beam irradiating a measurement subject, said measurement subject reflecting said distance measuring light beam to generate a reflected light beam;

5 a plurality of photoelectric conversion elements that receive said reflected light beam, so that electric charge corresponding to an amount of said received reflected light beam is accumulated in each of said photoelectric conversion elements, and is disposed in a matrix arrangement;

10 a vertical transfer unit that is disposed along each vertical line of said photoelectric conversion elements, so that said electric charge accumulated in said photoelectric conversion elements is transferred in a vertical direction;

15 a horizontal transfer unit that is disposed nearby one end of said vertical transfer unit and in parallel with horizontal lines of said photoelectric conversion elements, so that said electric charge is transferred in a horizontal direction;

20 a electric charge transfer processor that transfers electric charge accumulated only in photoelectric conversion elements comprising effective horizontal lines, which are disposed every predetermined number of said horizontal lines;

25 a electric charge integrating processor that drives said electric charge transfer processor repeatedly and integrates said electric charge accumulated in said photoelectric

conversion elements comprising said effective horizontal lines,
in said vertical transfer unit; and

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a transfer operation control processor that controls said
horizontal transfer unit and said vertical transfer unit, so
5 that said horizontal transfer unit is driven only when said
electric charge corresponding to said effective horizontal lines
is transferred to said horizontal transfer unit.

13. A device according to claim 12, wherein said horizontal
lines are separated into a plurality of groups and said effective
10 horizontal lines are composed of one of said groups or combination
of said groups.

14. A device according to claim 13, wherein said horizontal
lines are separated into first, second and third groups, and
an arrangement of said first, second and third groups in vertical
15 direction is a repetition of a "first, second, second, third,
second, second" order.

15. A device according to claim 12, comprising an electric
charge discharging processor that starts accumulation of said
electric charge in said photoelectric conversion elements by
20 discharging unwanted charge accumulated in said photoelectric
conversion elements, and wherein said electric charge
integrating processor is operated by driving said electric
charge discharging processor and said electric charge transfer
processor alternatively.

25 16. A device according to claim 15, wherein said photoelectric

conversion elements are formed on a substrate, and said electric charge discharging processor discharges said unwanted charge to said substrate.

17. A device according to claim 16, wherein accumulation of electric charge corresponding to at least distance information of said measurement subject starts in said photoelectric conversion elements when an output of an electric discharging signal, which discharges said unwanted charge in said electric charge discharging processor, ends.

18. A device according to claim 17, wherein said light source radiates a pulsed beam of said distance measuring light beam during a first accumulating period, which is from an output of said electric charge discharging signal to an output of said electric charge transfer signal, and said electric charge corresponding to distance information regarding said measurement subject is integrated in said vertical transfer unit of said effective horizontal lines.

19. A three-dimensional image capturing device, comprising:
a light source that radiates light irradiating a

measurement subject;

a plurality of photoelectric conversion elements that can accumulate electric charge corresponding to an amount of light received by said photoelectric conversion elements, and disposed in a matrix arrangement;

a electric charge transfer control processor that

controls an electric transfer operation, which outputs electric charge accumulated in said photoelectric conversion elements to the outside of said photoelectric conversion elements;

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5 a distance calculating processor that calculates a distance, from said photoelectric conversion element to said measurement subject, from an amount of electric charge accumulated in said photoelectric conversion elements from light reflected by said measurement subject and received in said photoelectric conversion elements;

10 a first distance measuring processor that drives said electric charge transfer control processor in order to output electric charge accumulated in all said photoelectric conversion elements, and calculates distances corresponding to all said photoelectric conversion elements by means of said distance
15 calculating processor; and

a second distance measuring processor that drives said electric charge transfer control processor in order to output electric charge accumulated in selected photoelectric conversion elements, and calculates distances corresponding
20 to said selected photoelectric conversion elements by means of said distance calculating processor.

20. A device according to claim 19, comprising a distance measurement selecting processor that selects either said first or second distance measuring processor and drives the selected
25 processor.

21. A device according to claim 20, wherein said first distance measuring processor is for measuring a stationary measurement subject and said second distance measuring processor is for measuring a moving measurement subject.

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5 22. A device according to claim 21, wherein said photoelectric conversion elements comprise first photoelectric conversion elements and second photoelectric conversion elements a number of said second photoelectric conversion elements being less than that of said first photoelectric conversion elements, and said
10 second distance measuring processor comprising;

a first high speed mode that drives said electric charge transfer control processor so as to output electric charge from said first photoelectric conversion elements and calculates said distance corresponding to said first photoelectric conversion
15 elements;

a second high speed mode that drives said electric charge transfer control processor so as to output electric charge from said second photoelectric conversion elements and calculates said distance corresponding to said second photoelectric
20 conversion elements; and wherein

said distance is calculated with said first high speed mode when said measurement subject is moving at a relatively slow speed, and with said second high speed mode when said measurement subject is moving at a relatively fast speed.

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